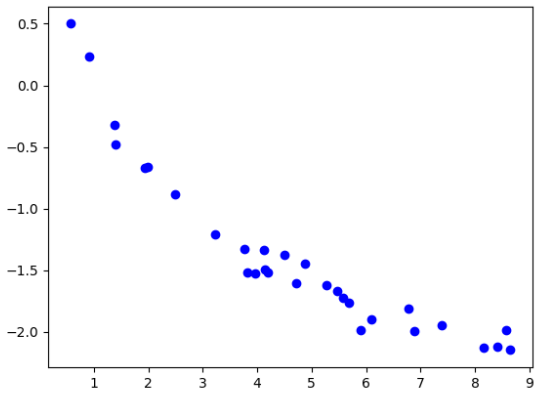
1. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Logarithmic model

C. Linear model

D. Exponential model

E. None of the above

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2. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° *C and is placed into a* 18° *C bath to cool. After 21 minutes, the uranium has cooled to* 83° *C.*

A. $k = -0.03388$

B. $k = -0.03301$

C. $k = -0.03476$

D. $k = -0.05110$

E. None of the above

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3. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 29 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 221 minutes

   B. About 36 minutes

   C. About 125 minutes

   D. About 20 minutes

   E. None of the above

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4. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 502 grams of element X and after 10 years there is 50 grams remaining.

   A. About 1 day

   B. About 5110 days

   C. About 1460 days

   D. About 1095 days

   E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 11136 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 15 minutes

   B. About 34 minutes

   C. About 91 minutes

   D. About 207 minutes

   E. None of the above

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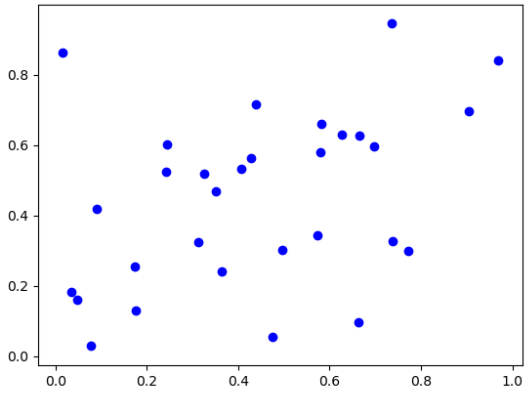
6. Determine the appropriate model for the graph of points below.



   A. Linear model

   B. Logarithmic model

   C. Non-linear Power model

   D. Exponential model

   E. None of the above

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7. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	40000	39986	39978	39972	39967	39964	39961	39958	39956

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 12° *C bath to cool. After 22 minutes, the uranium has cooled to* 94° *C.*

A. $k = -0.03379$

B. $k = -0.05748$

C. $k = -0.03333$

D. $k = -0.02745$

E. None of the above

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9. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 994 grams of element X and after 6 years there is 110 grams remaining.

A. About 1 day

B. About 2555 days

C. About 730 days

D. About 365 days

E. None of the above

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10. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20000	20027	20043	20055	20064	20071	20077	20083	20087

A. Non-Linear Power

B. Exponential

C. Logarithmic

D. Linear

E. None of the above
